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USSR Report

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No. 56



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USSR REPORT

ELECTRONICS AND ELECTRICAL ENGINEERING

No. 56

This serial publication contains articles, abstracts of articles and news items from USSR scientific and technical journals on the specific subjects reflected in the table of contents.

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USSR

UDC 621.375.4

NEGATIVE AMPLITUDE-ENVELOPE FEEDBACK FOR REDUCING THE DISTORTION IN WIDE-BAND TRANSISTOR AMPLIFIERS

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian Vol 22 No 5, May 79 pp 72-74 manuscript received 12 Dec 78

TAMM, D. L. and SHIPITSYN, A. A.

[Abstract] Nonlinear distortion in modern wideband high-frequency transistor power amplifiers is worse than -28 dB, according to the 2-tone method of measurement, and must therefore be reduced. Since the negative high-frequency feedback used in tube amplifiers is entirely unsuitable here, a negative amplitude-envelope feedback has been developed instead, which takes into account particular features of transistor devices. The circuit for this is one of a modulated aperiodic wideband amplifier with a linear modulation characteristic which does not add to distortion of the signal. It consists of a phase inverter on one transistor, a modulated push-pull stage on two field-effect transistors, and a differential amplifier. This design makes a 40 dB suppression of harmonics in the amplified signal feasible. The paper was recommended by the Department (Kafedra) of Radio Engineering, Leningrad Polytechnic Institute imeni M. I. Kalinin. Figures 1; tables 1; references 4: 3 Russian, 1 Western.
[25-2415]

2415

CSO: 1860

AMPLIFIER WITH ENHANCED EFFICIENCY FOR SIGNALS WITH LARGE PEAK FACTOR

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian No 8, Aug 79 pp 55-59 manuscript received 11 May 78; after revision 9 Nov 78

NOCIN, V. N. and DOGADIN, N. B.

[Abstract] One method for enhancing efficiency of amplifiers is power supply voltage switching as a function of transient values of the amplified oscillation. Two-cycle amplifiers with antiparallel connection of legs realize this principle, requiring only one power source. The most promising amplifiers are those with intermediate switching only, which is the simplest. Based on this type of transformer amplifier, an asymmetrical two-cycle choke stage was built and considered here. The left and right legs operate alternately. In the initial state, voltages on the blocking capacitors constitute $E/2$ and E , respectively. At low transient values of oscillation, the left leg is powered from capacitor C_1 , and the right one from the series-connected source E and capacity C_1 ; power supply voltage to each leg equals $E/2$. At great transient values, the left leg is powered from capacitor C_2 , and the right one from source E . Consequently, the relative magnitude of the lowest power supply voltage of each leg = 0.5. Figures 2; tables 1; references 2 (Russian). [15-8617]

8617

CSO: 1860

USSR

UDC 621.396.673.4

CALCULATION OF THE CHARACTERISTICS OF CIRCULAR ARRAYS OF WIDE-BAND RADIATORS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 10, Oct 79 pp 69-72 manuscript received after completion 5 May 79

DUDKOVSKIY, E. A. and FOMINTSEV, S. S.

[Abstract] Circular phased antenna arrays have been widely studied, but usually only for arrays made of simple elements. This work has as its purpose the estimation of the influence of the shape of the individual radiators on the characteristics of circular arrays. Calculations were performed for single-circle and double-circle arrays. It is found that the currents flowing through different wires of a single radiator may differ by more than a factor of 2 in amplitude and by more than 1 rad in phase. Figures 2; tables 2; references 2: 1 Russian, 1 Western.
[58-6508]

6508

CSO: 1860

USSR

UD 538.244.2

DESIGNING A POLE SHIELD FOR A.C. ELECTROMAGNETS ON A DIGITAL COMPUTER

Minsk IZV. VUZ: ELEKTROMEKHANIKA in Russian No 10, Oct 79 pp 855-861 manuscript received 1 Jul 77; after completion 13 Dec 77

BUGAYEV, G. A.

[Abstract] An algorithm of calculating the minimum force of an a.c. electromagnet with shielded poles has been written for a Mir-2 digital computer. It takes into account the drop of magnetomotive force in the pole steel, but disregards the shielded reactance as well as hysteresis and eddy currents. Furthermore, the mechanical force is determined by the fundamental flux component, and a correction factor uniquely dependent on the magnetic induction in the unshielded pole segment accounts for the small increment of instantaneous force due to all higher flux harmonics. On the other hand a correction factor uniquely dependent on the magnetic induction in the shielded pole segment accounts for the power loss in the shield due to all higher emf harmonics. While saturation of the pole steel is also disregarded, the nonlinear magnetization curve is approximated analytically with an expression relating the magnetic induction squared to the magnetic potential squared. The program provides for optimizing the shield parameters, namely the shielding factor and the electrical resistance as functions of the minimum pole force, on the basis of conventional relations and an analysis of approximation errors. Typical results are shown for grades E12 and E41 pole steel. Figures 3; references 6 (Russian). [102-2415]

2415

CSO: 1860

DESIGN AND STRUCTURE OF THE BASIC SUBSYSTEM FOR AUTOMATED DESIGN OF ELECTRIC DRIVES

Minsk IZV. VUZ: ELEKTROMEKHANIKA in Russian No 10, Oct 79 pp 866-871 manuscript received 28 Apr 79

BORODULIN, YU. B. and NUZHIDIN, V. N.

[Abstract] Changeover from individual engineering calculations to automated design systems is the key item in the strategy of utilizing computer hardware and software in the national economy. The major problems are organizing the continuous design process from start to finish and constructing a special-purpose automated design system which would match conventional techniques with specific goals. An example is the design of electric drives used in the various different branches of industry. Here the basic problem-solving a subsystem for this particular item is discussed. In addition to generally applicable principles, it also encompasses the principle of functional redundancy so as to provide alternative programs, the principle of anticipation so as to provide an ability to forecast trends and demands, the principle of implementability and adaptation, and the principle of traditionalism which allows old manual methods to be retained wherever they may be more advantageous. Automatic multitarget simulation is at the core of the realization of this basic subsystem. Structurally it consists of four groups of components: 1) Design process controls; 2) Decks of data control programs; 3) Decks of functional programs; and 3) Technology and tool programming. These components are distributed over three levels: 1) Upper level of invariant program decks for simulation in the time domain or in the frequency domain and of universal design procedures; 2) Middle level of special design and performance calculations with consideration of more specific object classes; and 3) Lower level of very specific design objects. Implementation of these goals is achieved in a special N-graph language. Programs can be edited, debugged, and adjusted for any specific object class or individual engineering teams in a special S-graph language. The design of the power part of electric drives has already been automated, the design of the controls part still requires some lookup tables as well as self-adaptation and object identification programs. Integrated programs including inspection and diagnosis procedures are most difficult to write, because of the many constraints arising from the diversity of equipment. The basic subsystem is realizable on a Unified System YeS computer and partially also on a Minsk-32 computer. References 11 (Russian).

[102-2415]

2415

CSO: 1860

USSR

UDC 62-526

OPTIMIZATION OF THE LINEAR ZONE OF THE ANALYZER IN AN OPTOELECTRONIC DISCRETE TRACKING SYSTEM

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian Vol 22 No 5, May 79 pp 75-78 manuscript received 12 Jul 78

GOLYAKOV, A. D. and KALINCHUK, V. I.

[Abstract] The image analyzer in an optoelectronic discrete pulse tracking system is considered, of particular importance being its static characteristic and the width of its linear zone. The system also includes an amplifier-converter which consists of an optimal filter and a threshold device followed by a computer, and a stepper motor in the feedback branch. The main sources of error are noise in the measuring device, relative shift between measuring device and light source, and imprecise manufacture of the instrument components. While the accuracy of tracking can be improved by increasing the slope of the static characteristics, this would increase the measurement error. Accordingly, the optimum slope as well as the width of the linear zone are calculated which will minimize the rms measurement error consisting of the three said components. The paper was recommended by the Department (Kafedra) of Optoelectronic Devices, Leningrad Institute of Precision Mechanics and Optics. Figures 3; references 5 (Russian). [25-2415]

2415

CSO: 1860

USSR

UDC 621.3.078

ALGORITHMS OF AUTOMATIC ADJUSTMENT OF AUTOMATIC SYSTEMS DURING TESTS

Minsk IZV. VUZ: ELEKTROMEKHANIKA in Russian No 10, Oct 79 pp 893-896 manuscript received 10 May 78

DEGTYAREV, O. V.

[Abstract] Testing is the necessary last stage in construction of automatic control systems (SAR). Here the problem of their adjustment during the test is considered, such an adjustment being difficult on account of the usually many performance parameters subject to regulation. The problem

is analyzed in a rather general formulation. It reduces to a problem in quadratic programming, solvable by the Hildret-d'Esopo method leading to iterative algorithms of optimization with respect to whatever criterial system performance parameter such as, for instance, its transient respond time. References 4 (Russian) (two Russian translations of Western books). [102-2415]

2415
CSO: 1860

USSR

UDC 621.391:517.52

A MODULAR ALGORITHM OF CALCULATING AN AUTOCORRELATION FUNCTION

Leningrad IZV. VUZ: *INFORMATIZIROVANNYE STROYENIYE* in Russian Vol 22 No 5, May 79 pp 16-19 manuscript received 10 Jan 78

POPOV, S. S. and BELOPOL'SKAYA, YE. V.

[Abstract] An algorithm of calculating an autocorrelation function is shown, a modular one which uses the inverse Walsh transformation. Especially in the case of higher-rank autocorrelation functions, it is $M=2^l$ times faster than the algorithm with a fast Walsh transformation and almost as accurate as the

$$K(m) = \frac{1}{N-m} \sum_{i=0}^{N-m} x_i x_{i+m} \quad (m = \overline{0, M}; i = \overline{0, N}, N-M)$$

formula, which even a fast Fourier transformation cannot speed up sufficiently. The algorithm recommended can be used during design of specialized computing devices. The paper was recommended by the Department (Kafedra) of Data and Control Systems, Leningrad Polytechnic Institute imeni M. I. Kalinin. Tables 1; references 2 (Russian). [25-2415]

2415
CSO: 1860

USSR

UDC 681.3.06

OPTIMUM SIZE OF THE SLIDER FOR PROCESSING OF SIGNAL PARAMETERS ON DIGITAL COMPUTER

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian Vol 22 No 5, May 79 pp 60-62 manuscript received 4 Apr 78

GORYACHEV, V. V., MISHIN, YU. S., OLERINSKIY, S. V. and PESKOV, N. YE.

[Abstract] In telemetry data processing with slider contact elements, characterized by two states (closed or open), it is essential to ensure their reliability. This problem has been analyzed in terms of false-alarm and missed-hit probabilities, both calculated according to appropriate algorithms in the ALGOL-1204 language on an ODRA-1204 digital computer and both functions of the processing parameters as well as of the slider length. Here the optimum slider length is determined which will minimize both probabilities when readings of instruments with two stable states are processed on a digital computer, when the output signals from such instruments have been quantized with respect to time. The paper was recommended by the Department (Kafedra) of Radio Equipment Design and Production, Ryazan Institute of Radio Engineering. Figures 3; references 3 (Russian). [25-2415]

2415

CSO: 1860

USSR

UDC 681.325.65

DISTRIBUTION OF THE BASIC ELEMENTS OF A LOGIC UNIT AMONG THE MICROCIRCUITS USED

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 10, Oct 79 pp 75-77 manuscript received after completion 12 Apr 79

YULIN, B. I., ZAKUPNEVA, L. M., MAZOVA, Z. P. and SMOLICH, G. G.

[Abstract] In general, automated electronic device planning systems do not principally include the task of selecting just which of the basic elements of the logic system will be included in each of the microcircuits to be used to make up the entire logic device. A system of programs has been developed to perform this task, which is divided into three parts: translation and

preparation of information for solution of the problem; arrangement of the basic element itself; and outputting of the results. An overall flow chart is presented. The program system runs on the M-222 computer and allows circuits containing up to 450 basic elements to be designed. Use of a reserve memory drum allows processing of circuits containing up to 600 basic elements. Circuits consisting of 35-40 microcircuit bodies can be designed in about 12 minutes of machine time. The authors thank V. P. Kozlov for assistance. Figures 1; references 3 (Russian).
[58-6508]

6508

CSO: 1860

UDC 538.56:621.391.14

OPTIMUM SPECTRAL REPRESENTATION OF SIGNALS

Moscow RADIOTEKHNIKA in Russian No 9, Sep 79 pp 77-78 manuscript received after completion, 22 Jan 79

KATS, V. B.

[Abstract] Many signal processing and pattern recognition problems can be solved by representing signals by spectral coefficients in some system of basis functions. One problem is the choice of a basis, which in most cases is done by intuition. Methods are given for selecting basis functions for derivation of spectral coefficients. The case of recognition of objects according to signals reflected against them is cited as an illustration. References 3 (Russian).

[34-8617]

8617

CSO: 1860

USSR

UDC 621.317.77

FREQUENCY INSTABILITY OF INPUT SIGNALS AND ITS EFFECT ON THE ACCURACY OF DIGITAL PHASE INDICATORS

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian Vol 22 No 5, May 79 pp 12-16 manuscript received 29 May 78

ZHILIN, N. S. and SIMON, S. KH.

[Abstract] The accuracy of phase-difference measurements is analyzed, taking into account the effect of frequency instability of input signals on the repeatability of the phase-frequency characteristics of instrument filters. The resulting error is best reduced by conversion of input signals to a stable intermediate frequency, with the aid of automated frequency control by the phase method using a highly stable reference oscillator. In digital phase meters with a constant measuring time, an analysis of a typically linear random frequency modulation due to a fluctuating supply voltage reveals that a longer averaging time tends to increase this error and the use of full-wave rectifiers will not decrease it. The necessary number of averaging

periods here must, therefore, be established on the basis of the frequency instability of input signals. The paper was recommended by the Department (Kafedra) of Television Apparatus, Tomsk Institute of Automated Control Systems and Radioelectronics. Figures 3; references 2 (Russian). [25-2415]

2415
CSO: 1860

USSR

UDC 621.376.3

IMPROVING THE ACCURACY OF A SERVODETECTOR OF FREQUENCY-MODULATED SIGNALS
PLAYED BACK FROM A MAGNETIC CARRIER

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian Vol 22 No 2, Feb 79 pp
21-26 manuscript received 10 Nov 77

GUDILIN, A. YE. and KIR'YANOV, O. A.

[Abstract] Playback from a magnetic carrier of signals with frequency modulation is considered regarding the effect of unstable carrier motion on the conversion from a space scale to a time scale, a compensation channel added to the servodetector with automatic frequency control by the phase method for suppressing the effect of parasitic frequency modulation. An analysis of the relations in such a detector indicates that the additive noise component can be suppressed only by a shorter time delay of the frequency modulator relative to the carrier speed instability, easily done by connecting the time delay circuit before the servodetector in the main channel, while the multiplicative noise component can be suppressed only by a faster passage of the feedback signal through the phase AFC circuit in the main channel. Tests indicate that such a 2-channel servodetector will reduce the noise at the output of any commercial magnetophone to 1.5-2 percent, as compared to a noise reduction to only 20-25 percent without the compensation channel. The paper was recommended by the Department (Kafedra) of Automation and Telemechanics, Chelyabinsk Polytechnic Institute. Figures 2; references 6 (Russian). [24-2415]

2415
CSO: 1860

USSR

UDC 621.376.9

EFFECTIVENESS OF THE USE OF SOLUTION FEEDBACK FOR DEMODULATION OF DISCRETE FM SIGNALS WITH LIMITED SPECTRUM

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 10, Oct 79 pp 53-56 manuscript received 13 May 78

MAKAROV, S. B.

[Abstract] Butterworth filters are studied as devices for limiting the spectrum of signals, necessary when discrete signals are transmitted in multi-channel communication systems with frequency modulation. It is found that for any given level of interference among characters, it is always possible to select an interval of analysis for a demodulator with feedback based on the solution which in practice completely achieves the maximum potential interference stability of reception. Figures 3; references 4 (Russian). [58-6508]

6508

CSO: 1860

UDC 621.391

STUDY OF TRACKING FAILURE IN A PSEUDORANDOM SIGNAL SYNCHRONIZATION SYSTEM UNDER THE INFLUENCE OF CARRYOFF NOISE

Moscow RADIOTEKHNIKA in Russian No 9, Sep 79 pp 74-77 manuscript received after completion, 5 Mar 79

PONOMARENKO, V. P.

[Abstract] A method for synchronous detection of the modulating function of wide-band pseudorandom signals (ShPS) is the tracking self-tuning of time delay. This method is implemented in delay tracking systems. A major problem is protection against carryoff interference of the same structural type as useful ShPS, but differing in amplitude and smoothly fluctuating delay. It is also important to study the effect of this interference on captured delay tracking systems (SSZ) which are synchronized with a useful signal.

This problem arises when the enemy side does not know the pattern of formation of ShPS and its detection require time expenditures. The results obtained make it possible to follow the relationship of the region of stability as a function of the parameters β , γ and μ . The results obtained in

this study together with those in an earlier paper (1978) by the author give a clear idea of the nature of change of synchronous conditions of SSZ from system parameters and noise. Figures 2; references 6: 5 Russian, 1 Western. [34-8617]

8617

CSO: 1860

USSR

UDC 621.391

THE EFFECTIVENESS OF DETECTION CODING OF CONTINUOUS SIGNALS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 10, Oct 79 pp 48-50 manuscript received after completion 29 Mar 79

KRASNOVSKIY, Z. M.

[Abstract] Equations are derived in order to estimate the potential interference stability of transmission with respect to errors in the communication channel when detection coding is used with continuous signals. The possibility is demonstrated of decreasing the mean square distortion arising due to errors in comparison to the mean square distortion when other known algorithms are used. Achievement of the known requires complex devices for calculation of the error function. A simpler method can be utilized, involving the use of logic device which determines the number of each corrected digit. Tables 1; references 3 (Russian). [58-6508]

6508

CSO: 1860

EFFECT OF RADIO CHANNEL SCATTERING FUNCTION ON SIGNAL-TO-NOISE RATIO

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian No 8, Aug 79 pp 87-90 manuscript received 28 Mar 78; after revision 5 Sep 78

RUBTSOV, M. I. and CHETYRKIN, N. V.

[Abstract] In radio channels with signal scattering in terms of delay and Doppler shift, e.g. in communications channels with frequency-time selectivity or with location of an extensive target, the parameters of the emitted signal must be matched with the characteristics of the scattering function of the channel in order to attain the maximum signal-to-noise ratio at the output of the receiver's matching filter. The magnitude of this ratio depends on the signal's modulation pattern and the form of the function $P(\tau, \omega)$. This relationship was studied using the example of several approximations of the scattering function. A comparison of the gaussian and rectangular signals shows that for these forms of the scattering function, a higher signal-to-noise ratio is achieved when using a gaussian signal. Figures 2; tables 1; references 7 (Russian).

[15-8617]

8617

CSO: 1860

DIGITAL ALGORITHMS FOR DISCRIMINATING PHASE-MANIPULATED WIDE-BAND SIGNALS

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian No 8, Aug 79 pp 65-72 manuscript received 15 Apr 77; after revision 5 Sep 78

AFANAS'YEV, V. P.

[Abstract] Replacement of analog processing of a signal-to-noise mixture by digital processing inevitably leads to additional energy losses; but these losses under interference conditions, in the form of broad-band steady-state noise, are small. The situation is different, however, when noise is accompanied by interfering signals having structural affinity to the useful signal. The use of analog algorithms of processing phase-manipulated broad-band signals at least does not lead to significant losses, because of the linearity of the algorithm and good reciprocal correlation properties of the signals; it was found that the quality provided by digital algorithms oriented

to the effect of noise interference is much lower than that of analog algorithms, and losses rise rapidly with an increase in intensity of the interfering signal. Figures 2; references 4 (Russian).
[15-8617]

8617
CSO: 1860

UDC 621.391.3

APPROXIMATE RELATIONSHIPS OF POTENTIAL NOISE IMMUNITY OF ISOLATED RECEPTION OF DIGITAL MESSAGES WITH SLOW SIGNAL FLUCTUATIONS

Moscow RADIOTEKHNIKA in Russian No 9, Sep 79 pp 23-27 manuscript received 14 Apr 79

RYAKOVSKIY, S. M.

[Abstract] Noise immunity of reception of digital messages, which are encoded combinations of binary symbols, is examined. Codes are first demodulated and then compared with a reference. If the code and the reference differ in even a single symbol, the code is omitted. Digital message reception is analyzed assuming that the intensity of the input signal fluctuates slowly. This also includes changes in signal intensity. A communications channel where distortions of discrete pulses of the code cluster due to noise are independent is examined. All methods are based on approximation of the relationship of conventional probability versus the signal-to-noise ratio. The author thanks L. S. Gutkin for valuable comments with respect to the work. Figures 1; references 6: 4 Russian, 2 Western.
[34-8617]

8617
CSO: 1860

LOGIC PROCESSING OF DISCRETE SIGNALS IN PARALLEL RECEPTION

Moscow RADIOTEKHNIKA in Russian No 9, Sep 79 pp 79-81 manuscript received 12 May 79

BELOV, P. V., IVANOV, G. N. and ORLOV, V. I.

[Abstract] An efficient method for processing signals in channels with fading and correlated noise is the logical summation of demodulated signals of partial channels. The law of summation which is optimum in terms of the criterion of the maximum of probability for demodulated signals is a weighted summation. Signal processing reduces to summation of partial solutions in channels with weighted coefficients defined by the probability of error in reception of each symbol. The algorithms described are extremely efficient and are about one order greater in terms of probability of error than majority bit summation. The number of simultaneously analyzed bits should be 8-10. Figures 1; references 3 (Russian).
[34-8617]

8617

CSO: 1860

RECEPTION OF SIGNALS WITH REDUNDANCY WITH UNKNOWN NOISE PARAMETERS

Moscow RADIOTEKHNIKA in Russian No 9, Sep 79 pp 71-74

ARZUMANYAN, YU. V., GINZBURG, V. V. and NAUMOV, A. S.

[Abstract] One of the most efficient methods for increasing noise immunity in transmission of discrete messages is to use complex signals with redundancy formed by encoding, separation, etc., in conjunction with reception as a whole. In the synthesis of receiving algorithms it is generally assumed that the spectral densities of noise affecting elements of the complex signal are known or identical, but this assumption can turn out to be unsound. In SW radio communications, spectral densities of noise in frequency subchannels can be different because of selective fading and the effect of narrow pole noise, and measurement of spectral densities is impossible due to the brevity of the communications session or the high rate of fading. In these circumstances, it is natural to use the law of the generalized maximum probability

for synthesis of an optimum reception algorithm. The algorithm which does not require a priori information on statistical characteristics of noise and signals can be used when realization of optimum laws of weighted summation are complicated. Figures 2; references 5 (Russian).
[34-8617]

8617
CSO: 1860

UDC 621.391.832

PASSAGE OF SIGNALS AND NOISE THROUGH AN IDEAL AMPLITUDE LIMITER

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian No 8, Aug 79 pp 84-87 manuscript received 22 Jun 78; after revision 16 Oct 78

DEYEV, V. V.

[Abstract] In multiple channel radio systems, several signals and noise can pass through an ideal limiter, whose amplitude characteristics represent a stepped function, $f(U) = E$. If several signals and selective noise arrive at the limit input, it equals the sum of the cosine of the carrier frequency, detuning of carrier frequency with respect to ω_0 , amplitude, the modulating signal and the initial phase of the i th signal. The initial phase is a random quantity uniformly distributed in the interval $[0-2\pi]$. The output power of the first signal is calculated where $H = P_2/P_1 = A_2^2/A_1^2$ is the ratio of powers of the input signals. Figures 1; references 3: 2 Russian, 1 Western.
[15-8617]

8617
CSO: 1860

NOISE IMMUNITY OF COHERENT RECEIVERS OF PHASE AND FREQUENCY TELEGRAPHY UNDER THE INFLUENCE OF PULSED INTERFERENCE AND WHITE NOISE

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian No 8, Aug 79 pp 82-84 manuscript received 17 Apr 78; after revision 19 Oct 78

YERSHOV, L. A.

[Abstract] The case is considered where an additive mixture of one of two completely known signals of width T of normal white noise with spectral intensity $N_0/2$ and chaotic pulsed interference arrives at the input of a coherent receiver of frequency and phase-manipulated signals. Chaotic pulsed interference implies a train of radio pulses with normed envelope, random mutually independent amplitudes, initial phases and instants of appearance. Random amplitudes have one-dimensional probability density and initial phases are uniformly distributed. With powerful pulsed interference, an increase in signal amplitude does not lead to substantial reduction in the probability of errors, which proves the need to employ special methods of protection against them. Figures 1; references 3 (Russian).
[15-8617]

8617

CSO: 1860

USSR

UDC 621.396:518.5

STATISTICS OF PHOTOELECTRONS UPON RECEPTION OF RADIATION PASSING THROUGH A TURBULENT ATMOSPHERE WITH A SCATTERING AREA

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 10, Oct 79 pp 61-64 manuscript received after completion 10 Jan 79

KAZARYAN, R. A. and OGANESYAN, A. V.

[Abstract] In many cases (optical radar, over-the-horizon communication) laser radiation must pass through the nonscattering turbulent layer of the atmosphere twice: before and after scattering. A study is made of the statistics of photoelectrons of radiation which is passed through the atmosphere twice, as recorded by a photodetector in the photon counting mode. Additive noises found to have a strong influence on the statistics of photoelectrons. The authors are grateful to D. S. Lebedev for helpful discussions. Figures 1; references 13: 8 Russian, 5 Western.
[58-6508]

6508

CSO: 1860

THE EFFECT OF POWER TRANSMISSION LINES AND PROPULSION POWER GRIDS OF ELECTRIC RAILROADS ON CABLE COMMUNICATION LINES

Moscow AVTOMATIKA, TELEMEKHANIKA I SVYAZ' in Russian No 8, Aug 79 pp 20-22

FEL'DMAN, A. B., candidate in technical sciences

[Abstract] Because of the increasing rate of construction of high-voltage electrical transmission lines, railroad propulsion power grids, and communications cables, the chances of noise induction are always on the rise. Furthermore, many electric locomotives use thyristor controls which produce upper harmonics in the propulsion power lines that interfere with communications cable transmissions. Considerations of environmental protection compel planners to avoid forests and rivers and run lines along existing rights-of-way, inevitably adjacent to other power and communications lines. It had been assumed that the metal jackets on underground communications cables would shield them from contiguous power lines in the high-frequency range, but this was obviously incorrect. With the increase in channels used in communications lines, they become more susceptible to noise from power lines. Existing regulations specify various means of protection: filters, voltage limits, etc. Theoretical and applied research in protection of communications lines in railroad transport have been lagging behind for 20 years. The FZ-1 device was developed by All-Union Scientific-Research Institute of Railway Transport to protect above-ground and cable communications lines and is undergoing improvement.

[17-8617]

8617

CSO: 1860

TESTING DEVICES OF CONTROL CENTRALIZATION OF THE "LUCH" SYSTEM PART III.
TESTING DEVICES OF THE CONTROL CENTRALIZATION POST

Moscow AVTOMATIKA, TELEMEXHANIKA I SVYAZ' in Russian No 8, Aug 79 pp 4-11

YECORENKOV, N. G., deputy head, Laboratory of Control Centralization, All-Union Scientific-Research Institute of Railway Transport

[Abstract] The "Luch" test stand is used to check out the operation of encoders at the control centralization post. In contrast to the circuit of an actual linear point, the test stand is able to receive, record and display remote control signals addressed to it from any linear point. The test stand of the ITS-L type contains remote control signal receiving and test signal transmission channels. Decoding and recording of the remote control signal is done by a circuit consisting of the following subunits: remote control signal length measuring circuit, digital signal decoding and realization circuit, remote control signal clock distributor, remote control signal register, and others. The remote control signal register contains 31 step 1 triggers, each of which locks in the arrival of the corresponding remote control signal clock pulse and 31 step 11 triggers, to the inverted output of each a control lamp is connected. Figures 5; tables 2.
[17-8617]

8617
CSO: 1860

USSR

UDC 681.2.088

DYNAMIC ERROR OF A MULTICHANNEL MEASURING SYSTEM

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian Vol 22 No 5, May 79 pp 8-12 manuscript received 28 Feb 77

ZAIKO, A. I.

[Abstract] A parallel 2-channel measuring system is considered, each channel being regarded as a linear dynamic component equivalent to several elements in series. The input signals to both are normal nonstationary random processes with given mathematical expectations and dispersions. So are the output signals from both, with the intercovariation functions of the input

process and the output process in each channel separately assumed to be known. On this basis, the systematic dynamic error of measurement is calculated and the result subsequently extended to an N-channel system. The paper was recommended by the Department (Kafedra) of the Theoretical Bases of Electrical Engineering, Ufa Institute of Aviation imeni S. Ordzhonikidze. Figures 2; references 5 (Russian) (one a translation of a Western book). [25-2415]

2415

CSO: 1860

Components and Circuit Elements, Including
Waveguides, Cavity Resonators and Filters

USSR

UDC 518.5:621.317.08.08.001.57

AN ENGINEERING METHOD OF CALCULATING THE PARAMETERS OF RECURSIVE DIGITAL
FILTERS

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian Vol 22 No 2, Feb 79 pp
3-9 manuscript received 18 Jan 78

ISMAILOV, SH. YU., KOMSHILOV, O. A. and SHKODYREV, V. P.

[Abstract] Recursive digital filters are used for forming stationary random processes with prescribed probability characteristics. Here an engineering method is proposed for calculating the parameters of such filters of any order N which may be used for forming, from a discrete white noise, a stationary random process with a rational-fractional spectral density distribution. It is based on the conventional recurrence algorithm, with transformation of a noncorrelated stationary normally distributed sequence to one which has the desired correlation function. Statistical averaging of the transforming function results in a system of equations which can be reduced ultimately to a system of N linear equations. In addition to solving the latter, the order N must first be established for given forms of the correlation function. Typical calculations are shown for various monotonic and oscillating correlation functions requiring filters of order $N=1$ to $N=5$. The calculations include error estimation. The method is universal and, with the aid of standard programs, can be automated. The paper was recommended by the Department (Kafedra) of Information-Measurement Engineering, Leningrad Polytechnic Institute imeni M. I. Kalinin. Figures 2; tables 3; references 5 (Russian).
[24-2415]

2415

CSO: 1860

USSR

UDC 621.372.54

QUANTIZATION NOISE IN A DIGITAL NARROW-BAND FILTER WITH NOTCHING AND INTERPOLATION OF THE OUTPUT SIGNAL READOUT

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian Vol 22 No 5, May 79 pp 3-7
manuscript received 20 Jul 77

VITYAZEY, V. V., DEMASHOV, V. S. and STEPASHKIN, A. I.

[Abstract] Under consideration are digital narrow-band filters with a notched pulse characteristic and with signal level quantization. The error of this quantization is estimated, after synthesis of such a filter has been reduced to synthesis of a low-pass filter and addition of an interpolator. The calculations are based on an appropriate weighting function, assuming first passage of white noise through the interpolator alone and then passage of noise to quantization of the input signal through the filter-interpolator series combination. The calculations are performed in the frequency domain, with notching taken into account, and ultimately yield the total noise dispersion due to quantization of both the input signal and the intermediate signal. The paper was recommended by the Department (Kafedra) of Automatics, Ryazan Institute of Radio Engineering. Figures 2; references 3 (Russian). [25-2415]

2415

CSO: 1860

USSR

UDC 621.372.54.037.372

EMPHASIS OF DIGITAL NONRECURSIVE REJECTOR FILTERS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 10, Oct 79 pp 56-59 manuscript received 1 Jun 79

POPOV, D. I.

[Abstract] Doppler signals against a background of narrow-band (correlated) noise can be detected on the basis of the spectral differences of signal and noise, a process which includes the operation of noise rejection. The noise rejection of a filter must achieve the desired attenuation in the rejection band, uniform transmission in the Doppler frequency band and a minimal transition area. A study is made of the method of synthesis of nonrecursive rejector filters which satisfy these requirements. As an example, a rejector filter is synthesized with nonuniformity and transmission band of ± 2 dB, $\theta_r = 0.09\pi$ and $N=10$. Minimum attenuations of 60 to 76 dB are achieved. Figures 1; references 2 (Russian).

[58-6508]

23

6508

CSO: 1860

DETERMINING THE OPTIMUM COMPLEX CORRECTION PARAMETER FOR A NONSTATIONARY FILTER

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian Vol 22 No 5, May 79 pp 19-24 manuscript received 20 Jul 77

BUKHARIN, S. V.

[Abstract] A nonstationary filter is considered with an FM signal at its input. The optimum complex correction factor is determined which will minimize the rms error of signal recovery at the output, this filter being represented as a variable-gain controllable amplifier in series with a selective fourpole network whose transfer function does not significantly distort FM signals. For this purpose, the output signal is calculated from the equations of state and the envelope of this signal is expressed as a function of time and correction. The optimum complex parameter is one which minimizes the integral of the envelope of the transient+corrective signal component with respect to time. The modulus and the argument of this parameter, also the correction efficiency index relative to correction of a stationary filter, have been evaluated numerically for Butterworth filters of orders 1,2, 3,4 and frequency deviations ranging from -1 to 1 (normalized with respect to half the bandwidth). The paper was recommended by the Department (Kafedra) of Engineering Cybernetics and Automatic Control, Voronezh State University imeni Lenin's Komsomol. Figures 1; tables 1; references 2 (Russian) (one a translation of a Western book).
[25-2415]

2415

CSO: 1860

THE DESIGN OF UNIDIRECTIONAL FERRITE STRIP LINES

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 10, Oct 79 pp 19-24 manuscript received 1 Feb 79

POKUSIN, D. N. and DEYGEN, M. I.

[Abstract] A study is made of unidirectional symmetrical and asymmetrical strip lines made with both uniformly and nonuniformly magnetized ferrite with losses. Calculations are performed for various values of boundary conductivity, allowing estimation of the accuracy of the results of calculation. The complex delays of forward and reverse waves characterizing expansion of the range of unidirectionality are determined for a two-step distribution of the magnetizing field. Figures 3; references 6: 4 Russian, 2 Western. [58-6508]

6508

CSO: 1860

UDC 621.396.049.77

CALCULATION OF DESIGN AND TECHNOLOGICAL ASPECTS OF ELECTRONICALLY-TUNABLE MATCHING FILTERS WITH SELECTION OF A COMPLEX SIGNAL

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian No 8, Aug 79 pp 60-64 manuscript received 10 Apr 78; after revision 27 Nov 78

SMIRNOV, N. I. and KARAVAYEV, YU. A.

[Abstract] Acoustic surface wave (ASW) matching filters are widely used for reception of complex phase-manipulated signals with large base (up to 1000). ASW matching filters consist of a piezocrystalline soundguide which contains integrally-diffused interdigital transducers (VShP) of electro-acoustic surface waves, whose leads are connected to the adding bus. For binary phase-manipulated signals, phase rotation by 180° in the tap is effected by reversing the polarity of the connection to the adding bus. Switching of electronically-tunable matching filters (EPSF) can be handled by p-i-n diodes. The number of p-i-n diodes equals the number of switched taps. The commutation of tap segments reduces several times the number of

commutating diodes and thereby greatly simplifies the design of large-scale hybrid ICs. Figures 5; references 9 (Russian).
[15-8617]

8617
CSO: 1860

USSR

UDC 621.374.5

THE STABILITY OF THE PARAMETERS OF ELECTROMAGNETIC DELAY LINES

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 10, Oct 79 pp 77-80 manuscript received after completion 7 Mar 79

BELIKOV, N. I.

[Abstract] Because delay lines are made of inductance coils and condensers which consist of temperature-dependent materials, the delay time is temperature dependent as well. Expressions are derived for calculation of the temperature coefficient of delay time, to allow design of delay lines with the least possible variation of delay time with temperature. Measures are noted which allow the process of aging to be accelerated, decreasing the change in parameters of the delay line with time by approximately a factor of 2 and thus stabilizing the operation of delay lines in various devices. Figures 3; tables 2; references 5 (Russian).
[58-6508]

6508
CSO: 1860

NEW CODE ELECTROMAGNETIC RELAYS

Moscow AVTOMATIKA, TELEMEXHANIKA I SVYAZ' in Russian No 8, Aug 79 pp 18-19

ZEKTSER, D. M., candidate in technical sciences

[Abstract] The Kiev Testing and Manufacturing Association Kontakt produced the first mass-produced batch of type RPS (intermediate machine tool construction relay) relays, based on the technical specifications for the KDR-73 relay developed by the Transsvyaz' Plant. The relay contains a non-branching magnetic system consisting of an L-shaped frame 4 mm thick, core with pole tip and rotating armature, and a winding on an insulated housing and original contact systems with armature drive. Reliability and durability are increased because of the use of wear-resistant, freeze-resistant insulating materials: glass-polyamide and diflon (polycarbonate). Exclusion of screws and plungers from the relay enhances vibration stability and strength; coating of all current-conducting parts and the winding with compound increases dielectric strength and mechanical wear-resistance. The KDR-73 relay is manufactured on a technical level corresponding to similar relays produced by leading foreign companies. Figures 2; tables 1.

[17-8617]

8617

CSO: 1860

UDC 621.274.4

CALCULATION OF OPTIMUM CONDITIONS OF A DIODE WITH CHARGE STORAGE IN A
FREQUENCY MULTIPLIER

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian No 8, Aug 79 pp 50-54 manuscript
received 19 Jan 78

YAKOVENKO, V. A., SAVCHENKO, S. M. and TITYUKOV, YU. G.

[Abstract] Calculation of dynamic impedances, efficiency of conversion and the diode bias circuit with charge storage (DNZ) in a frequency multiplier should be based on the model of a diode which incorporates basic physical processes governing the conversion and loss of power in the diode. The most accurate physical and topological models of semiconductor structures are complex and are therefore not applicable in practical calculations of equipment using these devices. A good compromise between accuracy and complexity is the charge-controlled model of a DNZ which allows us to keep track of the basic physical processes in the diode. An algorithm is proposed for computer calculation of optimum conditions of DNZ in a frequency multiplier built on a parallel circuit. Realization of a broad-band frequency multiplier using the theoretical results presented here, and the repeated use of the program described in developing broad-band SHF multipliers showed completely satisfactory accuracy of calculation of DNZ conditions. References 2 (Russian). [15-8617]

8617

CSO: 1860

UDC 621.396.62:621.372.632

STUDY OF A SCHOTTKY BARRIER DIODE COOLED MIXER FOR THE EIGHT MILLIMETER WAVELENGTH

Moscow RADIOTEKHNIKA in Russian No 9, Sep 79 pp 45-47 manuscript received 25 Feb 79

GRECHKO, S. I.

[Abstract] One possible way to design a low-noise receiving system is to use a superheterodyne with a mixer at the input cooled to cryogenic temperatures. Methods for calculating the transmission characteristics of Schottky barrier diode mixers, allowing for the variable capacitance of the diode barrier were presented by Pumper (1950) and Bordonskiy. Liechti (1970) found the noise characteristics of mixers under wide-band conditions through the mirror channel allowing for variable barrier capacitance. These methods were used to calculate monopole losses of conversion and the noise temperature of a mixer. The transmission and noise characteristics of cooled and uncooled Schottky barrier diode mixers were calculated for the model of a diode having an exponential volt-ampere characteristic curve. According to theoretical analysis of a mixer based on representation of the diode as variable active and reactive capacitances in the millimeter wave region, it is possible to realize a mixer cooled to 77° Kelvin with noise temperatures of about 100 to 250°K. The author expresses deep appreciation to V. S. Etkin, Yu. B. Khapin and G. S. Bordonskiy for constant attention and assistance in the work. Figures 5; tables 1; references 10: 5 Russian, 5 Western. [34-8617]

8617

CSO: 1860

USSR

UDC 621.13

LOSS DIAGRAMS FOR EVALUATING THE RELIABILITY OF ELECTRICAL EQUIPMENT IN ENTERPRISES

Kiev ENERGETIKA I ELEKTRIFIKATSIYA in Russian No 3, Jul/Sep 79 pp 47-48

SIN'KOV, V. M., doctor in technical sciences, and KALIBERDA, V. T., engineer, Ural Academy of Agriculture

[Abstract] Loss diagrams of load decrease versus time can serve as a basis for evaluating the reliability of electrical equipment not only in the case of many small consumers throughout a residential community, for instance, but also in the case of a few large enterprises. In the latter case one can easily compound the power loss with financial loss due to equipment failure, danger to human life or to irreplaceable equipment being regarded as an infinitely large loss. Such diagrams can serve as a useful tool in planning and design of active and standby electrical equipment, selection from among available alternatives, for various categories of users and branches of industry. Figures 1.

[96-2415]

2415

CSO: 1860

USSR

UDC 621.315.615.2.001.5

GAS STABILITY OF TRANSFORMER OILS OF VARIOUS HYDROCARBON COMPOSITIONS IN AN ELECTRIC FIELD

Moscow ELEKTRICHESKIYE STANTSII in Russian No 12, Dec 79 pp 45-48

GOLOVAN', G. D., engineer, All-Union Scientific Research, Design Engineering and Technological Institute of Transformer Building, and SHTERN, YE. N., candidate in technical sciences, All-Union Twice Order of the Red Banner of Labor Institute of Heat Engineering imeni F. E. Dzerzhinskiy

[Abstract] Liquid hydrocarbons in transformer oil decompose in high-intensity electric fields such as corona discharge so that gases evolve. A study was made in order to determine the ability of such oils to absorb and bind these gases rather than letting them escape and form detrimental ionizable inclusions. The transformer oils in this study were several Soviet grades

as well as foreign grades from various regions of the world. Their structural composition was determined in terms of paraffins and aromatic hydrocarbons. Their electrophysical parameters, namely dielectric permittivity and loss tangent, were measured according to GOST 6581-75. The gas emission or absorption was measured volumetrically with a Bennet apparatus, as a function of the percent carbon content as well as of the related to it density and refractive index of the oils, also as a function of time in a corona discharge. The tests were performed at $40 \pm 0.3^\circ\text{C}$ for 100 min in an electric field of 7.4 kV/mm intensity and for 30 min without a field. The results confirm that, while oils without aromatic hydrocarbons emit gases, the presence of increasingly heavy aromatic hydrocarbons reduces gas emission and eventually can bring about a transition to gas absorption. Such a transition occurs in an atmosphere of ionizing hydrogen, but will not be reached in an atmosphere of ionizing nitrogen or air. An analysis of the data reveals that Soviet transformer oils, except the TS_p special high-purity grade, and oils from Iraq, France, Algeria, and America absorb gases and thus are stable in an ionizing hydrogen atmosphere. All other foreign grades are not stable. Figures 4; tables 3; references 5: 4 Russian, 1 Western. [104-2415]

2415

CSO: 1860

USSR

UDC 621.317.725(088.8)

CAPACITIVE POTENTIAL TRANSFORMER WITH CORRECTION

Moscow ELEKTRICHESKIYE STANTSII in Russian No 12, Dec 79 pp 17-20

SOKOLOVA, R. N., candidate in technical sciences, All-Union Scientific Research Institute of Electric Power

[Abstract] Capacitive potential transformers are widely used as instrument and relay transformers in high-voltage (500-750 kV) networks. Essentially the nominal-frequency capacitive impedance of the voltage divider is compensated by the inductive impedance of the reactor, and ferroresonance oscillations due to clearing of short circuits on the secondary side are suppressed by ballast resistors, filters, or dampers. Here the errors of such transformers are analyzed and means of their correction are shown. These errors include the error inherent in the accuracy class of the transformer design and due to the burden, the error caused by a non-sinusoidal input voltage and resulting uncompensated higher-frequency harmonics, as well as the error due to voltage drops across long conductor lines. A corrector

for a low-power large-error capacitive potential transformer has been designed on the basis of complete precise simulation, and built using K553UD2 operational amplifiers with transistor stages. This corrector not only compensates instantaneous amplitude and phase errors but also reduces the duration and the amplitude of free transients at the transformer output, thus improving the performance of meters and relays connected to it. Figures 5; references 2 (Russian).

[104-2415]

2415

CSO: 1860

UDC 621.396.6

EMISSION OF DARK CURRENTS INDUCED ON AN IDEALLY CONDUCTIVE HALF-PLANE BY AN
ELEMENTARY ELECTRICAL VIBRATOR PARALLEL TO ITS EDGE

MOSCOW RADIOTEKHNIKA in Russian No 9, Sep 79 pp 31-35 received after comple-
tion 26 Mar 79

PIMENOV, YU. V. and PROSTAKOV, YE. I.

[Abstract] The problem of diffraction of electromagnetic waves on an ideally
conductive plane screen can be reduced to determination of the density of dark
current; this greatly simplifies the construction of its asymptotic solution
for screen dimensions larger than the wavelength. Dark current in many cases
should be sought in the form of the sum of partial dark currents resulting
from the effect of diverse factors. A cylindrical system of coordinates is
utilized with an electrical vibrator situated parallel to the edge of the
half-plane, creating a vector potential. The problem of diffraction of a
spherical electromagnetic wave on an ideally conductive half-plane was solved
by Vandakurov in 1954. The density of currents induced on the half-plane is
determined by one of his formulas.
[34-8617]

8617

CSO: 1860

UDC 621.396.9

DOPPLER FILTRATION IN SW DIRECTION FINDING. ANALOG-DIGITAL PROCESSING OF
A MODULATED SIGNAL

MOSCOW RADIOTEKHNIKA in Russian No 9, Sep 79 pp 3-6

AFRAYMOVICH, E. L. and PANCHENKO, V. A.

[Abstract] A large network of operational radio probes with good frequency,
spatial and time resolution is necessary in order to solve today's scientific-
research and applied problems in the study of the ionosphere and propaga-
tion of short radio waves. Pulsed SW transmitters can not be used to set
up this network, because the required transmitter output is up to 100 kW or
more and the frequency bandpass is 10-100 kHz. This has stimulated the de-
velopment of interference methods of probing the medium using continuous

signals, recently made possible because of advances in the theory and technology of coherent signal processing. In 1973, multidimensional comprehensive processing of a SW signal was proposed in order to separate components and to measure angles of arrival and cluster delay. The US and Germany published patents in 1976 proposing various versions of direction finders with Doppler filtration. A phase direction finder with Doppler filtration can process not only AM signals, but also SSB with incompletely suppressed carrier, AT, ChT, DChT and even pulsed signals. Doppler shifts are less than 5 Hz for a calm ionosphere. Even at a minimum standard rate of transmission at 50 baud, it is possible to produce an average of 5-10 readings per period. The authors thank L. A. Lobachevskiy for constant attention and assistance in the work. Figures 4; references 22: 11 Russian, 11 Western.
[34-8617]

8617

CSO: 1860

UDC 621.372

STUDY OF NOISE IMMUNITY OF GENERATING STRUCTURES BY THE ANALOG SIMULATION METHOD

Moscow **RADIOTEKHNIKA** in Russian No 9, Sep 79 pp 27-30 manuscript received 15 Apr 79

UKHARSKIY, V. P. and GORBAKOVSKIY, YU. I.

[Abstract] A relationship is found between the duration of a transient process in generating structures and the width of a received elementary signal where noise immunity of the generating structure is maximum. It is given that the width of the received elementary signal is related to the duration of transient processes in the generating structure. Experimental analysis of generating structure noise immunity was done using the example of simulation of a two-component generating structure. Nonlinear polyvalent generating structures are devices of quasi-optimum reception of biorthogonal signals in noise which approach optimum devices in their noise immunity. Approximation of generating structures to optimum devices is assured by the sequential integration of the input signal in the loop during a specific time (passive operating mode) and then in the generating structure under conditions of excited oscillations. Figures 7; tables 1; references 6: 5 Russian, 1 Western.

[34-8617]

8617

CSO: 1860

UDC 621.376

STUDY OF STABILITY OF PHASED FREQUENCY AUTOTUNING SYSTEMS WITH TWO PERIODIC NONLINEARITIES [Devoted to the Memory of Professor S. I. Yevtyanova]

Moscow **RADIOTEKHNIKA** in Russian No 9, Sep 79 pp 47-50 manuscript received 9 Jan 79

SAFONOV, V. M.

[Abstract] There is a clear trend toward increasing size in theory and practice of phased frequency autotuning systems. The structure of movements is determined not by one periodic function of phase and its derivatives, but by several. Analysis of global stability is one of the most urgent and complex problems. In contrast to traditional systems of phased frequency

autotuning systems with one periodic nonlinearity, systems with two periodic nonlinearities correspond to toroidal phase space, not cylindrical. This space may be interpreted as the set of trajectories of stable and unstable n-dimensional special points and their neighborhoods, periodically repeated along a coordinate and its orthogonal coordinate. The use of the method makes it possible to establish that change in shape of the characteristic curve from sawtoothed to symmetrical triangular leads to approach of the boundaries of canonical regions to their coincidence. Figures 1; references 6 (Russian).

[34-8617]

8617

CSO: 1860

UDC 621.391.822

QUASI-OPTIMUM PROCESSING OF ZERO INTERSECTIONS OF SIGNAL AND NOISE MIXTURES

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian No 8, Aug 79 pp 45-49 manuscript received 14 Feb 78; after revision 14 Jul 78

PUKHNYUK, YU. V.

[Abstract] The method of processing zero intersections of input oscillation other than optimum has been studied earlier; the method was very efficient under conditions of steady-state and transient interference. The problem of an algorithm of quasi-optimum processing of zero intersections was studied for a mixture of a determinate signal and steady-state gaussian noise. Analysis of the results suggests that quasi-optimum processing of zero intersections is more efficient than non-optimum processing, but is inferior to an optimum receiver of a determinate signal with a threshold signal-to-noise ratio on the order of one decibel. Solution of the problem of technical realization of some method of processing zero intersections will be determined by the complexity of the program instructions of the corresponding algorithms. Figures 1; references 10 (Russian).

[15-8617]

8617

CSO: 1860

USSR

UDC 621.391.832.22

STUDY OF STATISTICAL CHARACTERISTICS OF A LINEAR MODEL OF A PULSED SYSTEM FOR PHASE AFC

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 10, Oct 79 pp 9-13 manuscript received 9 Feb 79

PETROV, V. A.

[Abstract] A study is made of the process of statistical analysis of PPAFC based on the use of difference equations, which allows the production of expressions which are convenient for computer calculation. The equations derived are used to study the interference stability of PPAFC for phase and frequency modulated signals. Figures 1; references 8: 7 Russian, 1 Western. [58-6508]

6508

CSO: 1860

UDC 621.394.423

ANALYSIS OF TRACKING FAILURE IN PULSED SYNCHRONIZATION DEVICES

Moscow RADIOTEKHNIKA in Russian No 9, Sep 79 pp 62-66 submitted 6 Apr 79

BURDZEYKO, B. P. and PARAMONOV, A. M.

[Abstract] Synchronous systems of communications with a separate sync channel are widely used. When a pulse train with intrapulse manipulation is used as a sync signal, a natural model of sync parameters is the Markov series. Synthesis of synchronization devices is based on known results of filtration of Markov trains. Attention is focused on analysis of tracking failure in an actual simple measuring device of the Markov sync parameter. This method makes it possible to calculate virtually all characteristics of tracking failure in meters described by cited equations for any form of discrimination characteristic. Figures 2; references 3 (Russian). [34-8617]

8617

CSO: 1860

COMPARISON OF PHASED AUTOTUNING SYSTEMS WITH CROSS COUPLING AND SYNPHASE
ADDING IN TWO-CHANNEL RECEPTION

Moscow RADIOTEKHNIKA in Russian No 9, Sep 79 pp 58-61 manuscript received
5 Apr 79

MERKISHIN, G. V.

[Abstract] Questions of stability and transient processes in phased auto-tuning systems (APF) with cross coupling have been examined earlier and an expression has been derived which connects signal phase in the channel after APF with signal phases at the inputs of the system under conditions where linearization of characteristics of APF circuits is permissible. In view of the identity of channels and symmetry of the circuit, it suffices to analyze the signal phase characteristics of one channel. Comparison of wide-band APF with cross coupling and a synphase adding system under conditions of two-channel reception of an harmonic signal in the presence of independent normally distributed noises in both channels showed that the wide-band system should be used for two-channel reception of a weak signal; and both systems yield identical results in reception of a strong signal. Figures 4; references 3 (Russian).

[34-8617]

8617

CSO: 1860

UDC 621.391:65.011.46

BRINGING RADIO COMPONENTS INTO COMPARABLE FORM IN TERMS OF PRODUCTIVITY AND EXPENDITURES

Moscow RADIOTEKHNIKA in Russian No 9, Sep 79 pp 40-42 manuscript received after completion 27 Feb 79

YURLOV, F. F.

[Abstract] When it is necessary to compare radio electronic systems in terms of productivity, it is recommended that the volume of production q per unit time and the expenditures required to create and operate the process are compared. The quantity q may be the amount of information transmitted per unit time, the number of radio measurements in time; the number of objects detected by radiolocation, etc. This approach to evaluating efficiency of radio electronic systems is advantageous since two major generalized characteristics of the planned process are considered: productivity and expenditures in the sphere of production and operation. In addition, the "cost" of a production unit of a certain system is defined. The use of this approach, however, is associated with some constraints, making it necessary to have additional technical and economic analysis. Noncontinuous communication is compared to frequency telegraphy for transmission of information. Since reduced expenditures of the noncontinuous communication system were less than analogous expenditures for the system without the inverse channel, the noncontinuous communication system should be considered more efficient than frequency telegraphy. References 4 (Russian).
[34-8617]

8617

CSO: 1860

USSR

UDC 389.14:006.015.5

BETTER METROLOGIC SUPPORT FOR LENINGRAD

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 11, Nov 79 pp 3-5

FATEYEV, A. M., chief, Industrial Division of Leningrad Party Executive Committee and TARBEYEV, YU. V., general director, Scientific Research Institute of Metrology imeni D. I. Mendeleyev

[Abstract] A planary session of the Oblast Party Committee discussed the most effective means of fulfilling the combined plan for economic and social development of Leningrad and the surrounding oblast. One result of the discussions was to turn the attention of party committees and technical personnel to the creation of progressive equipment and tools. Characteristically, some 13 percent of new types of equipment, designed in the Soviet Union, are now being produced in Leningrad. Improvement of the quality of metrologic equipment is a basic factor in the development of new and improved industrial products in Leningrad. The scientific and productional organization known as the All-Union Scientific Research Institute of Metrology imeni D. I. Mendeleyev has been assigned the task of scientific-methodological and organization leadership of metrologic support for Leningrad's industries. The status of metrology has been studied at all enterprises in the city in order to produce objective information on the level of metrologic support of the enterprises as a whole, as well as individual stages in the development, production and use of industrial products. The Party, as always, is bravely stepping forward in the direction of improved metrologic support for Leningrad's industry.

[70-6508]

6508

CSO: 1860

USSR

UDC 531.714.7:53.089.6

A DIGITAL SCANNING MICROMETER

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 11, Nov 79 pp 21-22

MIRONENKO, A. V., YANUSHKIN, V. N. and KOLYADA, YU. B.

[Abstract] The MRTS01-0.1 scanning micrometer was developed at the Moscow Higher Technical School, and is designed for measurement of dimensions and testing of shape error of precision products. The device has high resolution, low sensitivity to industrial noise and high vibration resistance. A functional diagram of the device is presented. It consists of a measuring head and an electronic unit. The measuring head is based on an Uverskiy interferometer plus a measuring raster. The operation of the device is described. The range of measurement is 1.0 mm, in steps of 0.1 μm with maximum error 0.15 μm , measuring force 1.0 N, dimensions of head 240 X 130 X 50 mm, electronic unit 460 X 290 X 160 mm. It is powered by a 220 V ac line. The mass of the head is 1.0 kg, of the electronic section 8.0 kg. Figures 1; references 4 (Russian).

[70-6508]

6508

CSO: 1860

USSR

UDC 534.615:621.372.41

METHODOLOGIC ERROR IN THE ACOUSTICAL METHOD OF MEASUREMENT OF VOLUMES

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 11, Nov 79 pp 22-24

MONASTYRSKIY, S. M. and POLUNOV, YU. L.

[Abstract] In the acoustical method of measurement of volumes, sonic oscillations are transmitted into a vessel through the neck and the resonant frequency of the cavity formed by the vessel and its neck is measured. This article analyzes the methodologic error involved in the use of this method. The results of the calculations were tested by acoustical measurement of 2 vessels of known volume of different shape. Figures 2; references 6: 3 Russian, 3 Western.

[70-6508]

6508

CSO: 1860

USSR

UDC 539.216.2:531.717.5

CRITERIA FOR ESTIMATION OF ACCURACY OF MEASUREMENT OF THICKNESSES OF FILMS AND COATING

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 11, Nov 79 pp 25-26

SERGEYEVA, A. I.

[Abstract] Thin films of metals, semiconductors and insulators manufactured by various methods are widely used in many branches of industry. Various methods and devices have been developed for measurement of thicknesses. Errors resulting from averaging of local measurements over large areas and the deformation involved in contact measurement of thicknesses are discussed. The development of nondestructive testing methods allowing high accuracy measurement of thicknesses during the process of production, so that the results of measurement can be used to control the actual process, would allow the production of high quality thin films. Figures 1; references 9 (Russian). [70-6508]

6508

CSO: 1860

USSR

UDC 621.3.081:621.375.826

STUDY OF THE CHARACTERISTICS OF PHOTODIODES

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 11, Nov 79 pp 40-41

VITLINA, A. D., STYSIN, V. YE., TIKHOMIROV, S. V., KHATYREV, N. P. and CHERNOYARSKIY, A. A.

[Abstract] During the course of development of the first State Standard for laser radiation power, the task arose of creating and studying special systems for testing instability and maintaining the level of output power. This article discusses the selection of the photodiode devices used (type, operating mode and system of recording of output signal) and describes the method and results of studies of the basic characteristics of these photodiodes. The necessary requirements for photodiode parameters are discussed on the basis of the functional purpose of the source of laser radiation. Work is now under way on stabilization of external conditions, determination of additional destabilizing factors and improvement of the systems of recording of output signals. References 8: 6 Russian, 2 Western. [70-6508]

6508

CSO: 1860

USSR

UDC 621.3.088.2

ESTIMATION OF THE SCALE ERROR OF NOISE-LEVEL METERS

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian Vol 22 No 2, Feb 79 pp 18-21 manuscript received 7 Mar 78

VOLGIN, L. I. and GONCHAR, S. T.

[Abstract] An analytical expression is rigorously derived as a basis for calculating the permissible error of noise level readings on a noise-level meter scale. A direct-indication instrument is considered that consists of a transducer, a square-law detector, a d.c. amplifier and a needle indicator with a scale. The expression can be used for logarithmic scales; within a wide middle range it simplifies to a trinomial with a constant term, a linear term and a power term. In the case of a linear detector this trinomial simplifies further. The paper was recommended by the Department (Kafedra) of Radio Equipment Design and Manufacture, Ul'yanovsk Polytechnic Institute. Figures 1; references 4 (Russian).

[24-2415]

2415

CSO: 1860

USSR

UDC 621.317

MEASUREMENT OF THE FIELD INTENSITY OF INDUSTRIAL RADIO INTERFERENCE IN THE METER AND DECIMETER WAVE BANDS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 10, Oct 79 pp 46-48 manuscript received after completion 6 Feb 79

GUSEV, G. P.

[Abstract] The measurement method outlined in the All-Union norms for permissible industrial radio interference calls for measurement of the electric component of field intensity in the range from 30 to 300 MHz using a dipole antenna 3 m above the ground and 3, 10, 30, 50 or 100 m from the source of noise, depending on the type of noise source. This method is not sufficiently accurate at frequencies above 30 MHz, due to the interference structure of the field. The interference structure of the field is studied in detail for both horizontal and vertical components. It is found that

consideration of the interference structure of the field in the meter and decimeter wave ranges allows selection of the optimal height of the measurement antenna or optimal measurement distance. Figures 2; references 4 (Russian).

[58-6508]

6508

CSO: 1860

USSR

UDC 621.375.826.089.68

REPRODUCTION OF A UNIT OF MEAN LASER RADIATION POWER

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 11, Nov 79 pp 28-30

ZACORSKIY, YA. T., KAUFMAN, S. A., KOZACHENKO, M. L., KORMANKOV, A. A., KOTYUK, A. F., LIBERMAN, A. A., STEPANOV, B. M., TIKHOMIROV, S. V., CHERNOYARSKIY, A. A. and YAKOVLEV, V. A.

[Abstract] As of 1 July 1978, there is a State Standard and National Testing System for devices intended for measurement of the mean power of laser radiation in the 0.3-12.0 μm wave length band. The standard consists of a set of measurement devices and special equipment including a precision calorimetric device for measurement of the mean power of laser radiation, highly stabilized optical radiation sources, a system for testing the degree of blackness of the mean power transducer, as well as supporting devices to maintain pressure, temperature and transducer position. A structural diagram of the standard is presented. The error of the standard is ± 0.01 percent. Figures 2; references 1 (Russian).

[70-6508]

6508

CSO: 1860

UDC 621.316:621.3.024

D. C. SOURCE FOR INTEGRATED CIRCUITS

Moscow AVTOMATIKA, TELEMEXHANIKA I SVYAZ' in Russian No 8, Aug 79 pp 13-15

POPOV, N. P., chief designer, Design Bureau, Main Administration of Signalization and Communications, Ministry of Railroads, and LEVAK, L. P., engineer

[Abstract] Microelectronics is finding wider and wider application in railway transport: e.g., op amps such as IUT531, 140UD6, 140UD8, etc. These require two power sources of +15 and -15VDC. The digital IC, series 155, is powered by a +5 VDC source. A DC power source was designed for powering ICs which can be utilized in testing and tuning various components and devices during operation. The technical specifications of the DC power source are as follows: power supply 127/220 VAC + 10 percent/-15 percent, 50 Hz, 0.32/0.18 A. The source produces 60, +15 and -15 VDC at a load of 0.15 amps; +5VDC at a load of 2 amps. The 60 VDC output is unstabilized, but other voltages are stabilized. A KT603B transistor constitutes the single-cycle DC amplifier. A composite transistor consisting of KT801B, KT315G and KT803A transistors is the +5 VDC stabilizer. These stabilizers are sensitive to surges. To protect the control transistor, the circuit contains electronic protection consisting of current surge sensors (two 1-ohm and one 0.25-ohm resistors); transistor switches (three KT203B transistors); a trigger composed of two KT201B transistors. The protection circuit also contains a transistorized pulse generator (KT203B, KT201B) and solid-state breakers (three KT603B). Figures 1; tables 2.

[17-8617]

8617

CSO: 1860

USSR

UDC 681.326

CALCULATION OF THE MICROCIRCUITS OUTLAY FOR REALIZATION OF LOGIC FUNCTIONS

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian Vol 22 No 5, May 79 pp 53-56 manuscript received 20 Feb 78

USTYUZHANINOV, V. N.

[Abstract] Inasmuch as minimizing the number of logic functions does not necessarily reduce the equipment outlay, the problem of minimizing the number of microcircuits for realization of logic functions is analyzed and specifically applied to a conjunction. A single conjunction of rank r requires $N = (r-1)/(m-1)$ logic elements contained in pyramidal tiers of $R = \log_m n$ stages, where m denotes the number of signal inputs to one logic element and n denotes the number of external inputs to a pyramidal set (N and R rounded off to the nearest larger integer). Analysis and calculations on this basis reveal the relation between the complexity index of a function (rounded off to the nearest smaller integer) and the number of microcircuits needed to realize it. This is illustrated on an example of a binary device with AND elements realizing conjunctions and OR elements realigning disjunctions. The overall outlay is minimized by the optimum selection of commercially available microcircuits, in this case K2LI041 and K1LL201. The paper was recommended by the Department (Kafedra) of Radio Equipment Production Technology, Vladimir Polytechnic Institute. Figures 1; references 2 (Russian). [25-2415]

2415

CSO: 1860

USSR

PROBLEMS OF TRAINING OF ELECTRONIC ENGINEERS FOR PLANNING OF INTEGRATED CIRCUITS FOR DIGITAL COMMUNICATION AND REMOTE INFORMATION SYSTEMS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 10, Oct 79 pp 84-87

GOROKHOV, V. A.

[Abstract] It is noted that digital communications hardware is replacing analog hardware at a great rate. For example, by 1985 the Bell System plans to handle most of its communications load using type 4ESS exchanges. The requirements for training of engineers to design and operate large scale integrated digital communication systems are discussed. A table

presents the necessary raw data for determination of the basic classification requirements for microcircuit engineers involved in the planning of digital integrated communications systems. Such a specialist must have a combination of knowledge in the area of communication equipment and systems, digital and computer technology, microcircuitry and microelectronics, as well as an overall knowledge of microminiaturization. This will doubtless require an increase in the length of education and the inclusion of new disciplines, as well as radical restructuring of existing general engineering disciplines to improve the level of training of these new specialists.

Tables 1; references 15 (Russian).

[58-6508]

6508

CSO: 1860

UDC 621.373.43

HIGH-SPEED MAGNETIC SCANNING GENERATORS

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian No 8, Aug 79 pp 98-101 manuscript received 28 Jun 77; after revision 5 Feb 79

BERMAN, V. R., FROLKIN, V. T. and SOLOVEY, M. S.

[Abstract] High speed in a magnetic scanning generator can be achieved if a pulsed increase in power supply voltage is accomplished at a relatively low value of E_k at the front and a drop in the pulsed deflection signal. A magnetic scanning generator under class A conditions is analyzed for operation of the volt-additive circuit which introduces qualitatively new effects into the nature of the process of establishment of deflection current; the volt-additive control circuit is optimized and the necessary parameters for planning are determined. Figures 3; references 1 (Russian).
[15-8617]

8617

CSO: 1860

USSR

UDC 621.376.54

INFLUENCE OF NONLINEARITY OF THE LOAD ON A KEY MODULATOR ON OUTPUT SIGNAL DISTORTION

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 10, Oct 79 pp 36-38 manuscript received 1 Jun 79

ALEKSANYAN, A. A., SIVERS, M. A. and PLYUSNIN, V. N.

[Abstract] The impedance of an HF oscillator may change during operation as a function of the amplitude of the voltage applied. As a result, the modulator is loaded with a nonlinear impedance, causing the signal to be distorted as it is modulated. These distortions are estimated in this article for key modulators with PWM, considering the fact that the pulse repetition frequency is selected 5 to 7 times greater than the cut off frequency of the low frequency filter to reduce the level of combination distortions. The calculations performed were checked on a model of a solid state transmitter with an output power of 1 kW. The calculations show that the influence of load nonlinearities of distortions in a modulator could be

decreased by expanding the transmission band of the low frequency filter of the modulator. Figures 2; references 3 (Russian).
[58-6508]

6508

CSO: 1860

USSR

UDC 621.391.2:621.396.2

SUMMARIZATION OF ALGORITHMS OF THE OPERATION OF COHERENT DEMODULATORS FOR
BINAR SIGNALS WITH PHASE-DIFFERENCE MODULATION

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 10, Oct 79 pp 33-36

OKUNEV, YU. B.

[Abstract] Algorithms are known for demodulation of signals with k th-order phase-difference modulation (PDM- k) and equations have been derived for calculation of the interference stability for several values of k . The task of the present work is to find general algorithms for demodulation and equations for determination of interference stability with arbitrary k for coherent reception of binary signals. In coherent reception, the versions of the transmitted signal are considered known. Therefore, the coherent PDM- k signal demodulator consists of a coherent phase demodulator and a device to calculate the k th order phase difference. An equation is derived for calculation of the probability of error through the "error multiplication coefficient," defined as the number of errors at the output of a PDM- k demodulator when there is a single error at the output of the PM demodulator. Figures 1; references 7 (Russian).

[58-6508]

6508

CSO: 1860

USSR

UDC 621.31

QUALIFICATION AS THE BASIS FOR EVALUATING THE LABOR PRODUCTIVITY OF PERSONNEL IN ELECTRIC POWER PLANTS

Kiev ENERGETIKA I ELEKTRIFIKATSIYA in Russian No 3, Jul/Sep 79 pp 22-24

ZAIIKA, candidate in economic sciences, and PODVIGINA, V. I., engineer, Kiev Polytechnic Institute

[Abstract] Basic relations characterizing the labor productivity are reviewed and applied to personnel in electric power plants, separately for operating personnel and maintenance-repair personnel. Calculations for a typical electric power grid, taking into account the wage factor and the qualification factor, indicate that the latter can serve as a useful criterion, in terms of MW.h/man-year or rubles/man-year, for planning and accounting where improvement of productivity must be stimulated, and a reliable evaluation undistorted by other management considerations must be made. Tables 3; references 3 (Russian).
[96-2415]

2415

CSO: 1860

USSR

UDC 621.31.004

METHODS OF REGULATING THE ELECTRIC LOAD IN INDUSTRIAL ENTERPRISES

Kiev ENERGETIKA I ELEKTRIFIKATSIYA in Russian No 3, Jul/Sep 79 pp 44-46

DIKMAROV, S. V., candidate in technical sciences, L'vov Polytechnic Institute

[Abstract] On the basis of pertinent studies concerning production economics and management, made at the Economics Laboratory of the L'vov Polytechnic Institute, a set of recommendations has been prepared on how to regulate the electric load in industrial enterprises such as coal mines, cement mixing plants, metal casting and chemical shops. Accordingly, increasing the efficiency of production machinery and stockpile can reduce the load by 22 percent, enlarging the stockpile capacity can reduce the load by 2.5-26 percent, shutdown of auxiliaries can reduce the load by 5.3-9 percent, preventative maintenance of equipment can reduce the peak load by 21 percent,

changing the mode of operation can reduce the load by 1.5-5 percent, sequential shutdown of like machines on a line can reduce the load by 17 percent, and major overhaul in autumn and winter rather than in summer can reduce the load by 8-30 percent. These data are based on a study of 37 individual enterprises in which it is shown that according to a cost analysis, implementing these recommendations would, furthermore, save 891,600 rubles annually. Engineer N. G. ZHIZNEVSKIY, engineer L. V. NOGAYEVA [deceased], engineer D. A. SOSNITSKIY, and engineer I. I. STEPURA participated in the study. Tables 1.

[96-2415]

2415

CSO: 1860

UDC 621.317.61

INVESTIGATION OF DYNAMIC FEATURES OF PULSE SPECTRA

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian No 8, Aug 79 pp 38-44 manuscript received 19 Apr 78; after revision 13 Oct 73

SHEVELENKO, V. D.

[Abstract] Many problems can be solved by using harmonics of the pulse train repetition rate. Investigation of metrologic indicators of measuring equipment utilizing amplitude and phase spectra features of pulses with variation of their parameters requires that we know the structural aspects of modulation spectra: the aspects of pulse train spectra with variation of their parameters was studied. It was found that the change in nature of the distribution of modulation components of the spectrum with a change in the harmonic number of the repetition rate is accompanied by a change in sensitivity of all spectral components to change in the modulated parameter. The modulation components of the spectrum may be sensitive to changes in the modulated parameter which is several orders greater than that of the harmonics of the repetition rate. The presence of extremes of sensitivity of components of modulation spectra to variations in pulse parameters makes it possible to solve problems related to pulsed data processing in different ways. Figures 1; references 2 (Russian).
[15-8617]

8617

CSO: 1860

USSR

UDC 621.382

STABILIZATION OF PULSE DEVICES BUILT ON TRANSISTOR-TRANSISTOR-LOGIC MICRO-CIRCUITS

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian Vol 22 No 2, Feb 79 pp 60-65 manuscript received 16 Apr 77

D'YAKONOV, V. P. and LYKOV, P. G.

[Abstract] A method of improving the stability of pulse devices is shown applicable specifically to those built on TTL microcircuits. Instability of the time parameters is due to changes in the "1" output voltage and in the threshold switching voltage caused by fluctuations of the supply voltage

and of the temperature, as demonstrated by analysis of a simple time delay circuit. A negative feedback loop around the first stage, maintaining a "1" output voltage proportional to the threshold voltage of the second stage, will ideally make the instability of the time delay independent of the instability of both voltages. In reality some residual instability will remain. Such a feedback is effected by a resistive voltage divider ensuring a steep transfer characteristic and a high gain within that range. This method can be used for stabilizing the duration of multivibrator or time selector pulses, can also be built into integrated-circuit timers on the basis of standard TTL technology. It has been tested on a K1LB553 microcircuit with emitter followers in the output stage, triggered from a G5-15 pulse generator. The paper was recommended by the Department (Kafedra) of Industrial Electronics, Smolensk Branch, Moscow Institute of Power Engineering. Figures 4; references 4 (Russian).
[24-2415]

2415

CSO: 1860

USSR

UDC 528.711.7:621.396.965

SELECTING THE STRUCTURE OF A COMPUTER-BASED CONTROL SYSTEM FOR A LASER-MIRROR SCANATOR

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian Vol 22 No 2, Feb 79 pp 77-81 manuscript received 25 Sep 78

VYSKUB, V. G., MAMAYEV, V. L., ROZOV, B. S. and SAVEL'YEV, V. I.

[Abstract] Computer control of a laser-mirror scanator for processing of visual information is the only possible way to ensure the necessary accuracy within 10^{-3} - 10^{-4} percent, close to the resolution of interferometers which measure angular displacements. Here a closed-loop control structure is synthesized consisting of a continuous part and a discrete part. Its essential parameters such as the discretization period and transient characteristics are evaluated, on the basis of transfer functions, which will ensure adequate mirror stabilization during both position and velocity control. An analysis of requirements and performance indicates that a structure with an autonomous object stabilization system and an automatic algorithm for selecting the appropriate law of optimal control will be the most rational one. The paper was recommended by the Department (Kafedra) of Automation and Telemechanics, Moscow Institute of Engineering Physics. Figures 5; references 5 (Russian). [24-2415]

2415

CSO: 1860

USSR

UDC 62.378.325

PRODUCTION OF GIANT PULSES WITH LENGTHS OF TENS OF MICROSECONDS IN A SOLID-STATE LASER

Moscow ZHURNAL TEKHNIЧЕСКОЙ ФИЗИКИ in Russian Vol 49 No 10, 1979 pp 2202-2205 manuscript received 2 Jan 79

ASKAR'YAN, G. A. and MANZON, B. M., Institute of Physics imeni P. N. Lebedev, USSR Academy of Sciences, Moscow

[Abstract] A study was made of the possibility of lengthening giant sub-microsecond laser pulses produced by transverse opening of the resonator to yield a generation wave by a factor of 10 or more. Directed centering of the generation wave was also achieved with external initiation of the

local initial illumination of the film by an external source and the direction of movement of the focal point of the beam upon focusing by a lens with spherical aberration was recorded. Oscillographs illustrate the change in length of the laser pulse as the thickness of metallization of the film placed in the laser resonator was changed. Lasing is achieved by clarification of a spot on the metallized film by exposing it to the radiation of a second, focused laser. Figures 3; references 5 (Russian).
[64-6508]

6508

CSO: 1860

UDC 621.391.2

USE OF DIGITAL STATISTICS IN SEQUENTIAL DETECTION OF A SIGNAL IN PULSED
RADAR SYSTEMS

Kiev IZV. VUZ SSSR: RADIOELEKTRONIKA in Russian No 8, Aug 79 pp 10-14
manuscript received 10 May 78; after revision 30 Nov 78

KLOCHAN, YU. N. and SPEKTOR, A. A.

[Abstract] One of the problems of pulsed surveillance radar systems which have range resolution is the detection of a signal in each resolution element: to achieve quality of solution of this problem it is necessary to repeatedly scan a space and then store the results of reception. The direct utilization of digital statistics is possible if the median of distribution of sampling values equals zero in the absence of useful signal. Although a Neuman-Pearson detector operates with a known value of the quantity a , its efficiency is lower than a sequential digital detector: the advantage of the latter increases greatly as the probability of false alarm is reduced. Analysis shows that a sequential digital detector is competitive with the sequential rank detector and surpasses the Neuman-Pearson detector. The probability of false alarm and mean duration of the digital sequential procedure are independent of signal and noise parameters. Figures 2; references 5 (Russian).

[15-8617]

8617

CSO: 1860

UDC 621.391.8

ALGORITHM FOR ADAPTATION OF A CALMAN FILTER

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian No 8, Aug 79 pp 23-28 manuscript received 17 Apr 78; after revision 23 Nov 78

KOVAL'CHUK, I. A. and GORBUNOV, A. P.

[Abstract] Methods of modern theory of optimum filtration are widely used for secondary processing of radar information: the use of the Calman filter for these problems is more efficient when tracking a non-maneuvering targets. The algorithm of evaluation of the amplitude and moment of appearance of an input signal which elicited the maneuver are proposed. Substitution of these

estimates in the Kalman filter equations ensures adaptation of the filter to unknown maneuver parameters. For comparison, the mean quadratic error of range predictions using a nonadaptive Kalman filter are cited; these figures were calculated using methods which take into consideration a maneuvering target with acceleration of 50 meters per second squared; the figures are compared with the mean quadratic error of an optimum filter which is fully matched with the maneuver. This algorithm improves the efficiency of tracking a maneuver target and ensures tracking errors similar to those of an optimum filter. Figures 2; references 7: 5 Russian, 2 Western. [15-8617]

8617

CSO: 1860

UDC 621.391.26

QUALITY OF PROCESSING OF PERIODIC DISCRETE SIGNALS IN THE PRESENCE OF SYNCHRONOUS HARMONIC NOISE

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian No 8, Aug 79 pp 29-32 manuscript received 28 Feb 78; after revision 26 Sep 78

IPATOV, V. P.

[Abstract] In matched processing of wide-band signals of base B, it is possible to increase the ratio of outputs of useful signal and the intraband harmonic interference by B times. This increase is only possible with a uniform spectrum of harmonic noise within the signal bandwidth. In practice, it is often necessary to rely upon mismatched processing of periodic discrete signals (PDS): when complete suppression of side lobes on the time axis is necessary. The relationship given may be used to evaluate the degree of suppression of any harmonic (not necessarily synchronous) interference. The formulas cited are also suitable for finite signals. Figures 1; references 7 (Russian).

[15-8617]

8617

CSO: 1860

RECURRENT EVALUATION OF SIGNAL PARAMETERS IN "SKIP" INTERFERENCE UNDER CONDITIONS OF A PRIORI INDETERMINACY

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian No 8, Aug 79 pp 33-37 manuscript received 5 Apr 78; after revision 9 Nov 78

VISHNYAKOV, V. A. and KATIKOV, V. M.

[Abstract] The Bayes' algorithms for evaluating radio signal amplitude under conditions of "skip-like" distortions considered in Vishnyakov and Katikov (IZV. VUZ: Radioelektronika, 1979, 22, No 4, p 94) require a priori knowledge of the probability of occurrence of some interference and the densities of probability of the evaluated parameters. The maximally probable estimates were investigated for random "skip-like" distortions of a received signal, where distortions alter the nature of the received sampling data so much that extraction of transmitted information is either impossible or difficult and inefficient. The applicability of assumptions and simplifications used in analysis has been confirmed by statistical simulation on a computer of the recurrent algorithm for evaluating signal amplitude. Figures 1; references 2 (Russian).

[15-8617]

8617

CSO: 1860

OPTIMUM RECEIVERS AND DISCRETE SIGNAL PROCESSORS OF HYPERBOLIC RADIONAVIGATION SYSTEMS

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian No 8, Aug 79 pp 3-9 manuscript received 17 Apr 78; after revision 17 Nov 78

YARLYKOV, M. S. and DANILIN, V. S.

[Abstract] The problem of optimum analog processing of interfering pulsed signals of radionavigational hyperbolic systems operating under the influence of surface and spatial radio waves has been solved earlier. Using Markov theory of continuous-discrete filtration, the problem of synthesis of an optimum discrete receiver is solved. Optimum discrete processing of

interfering continuous radio signals is synthesized and its accuracy and noise immunity are evaluated where the receiver of a hyperbolic system is installed on a moving object. The use of optimum methods raises accuracy of analysis of the object's location and also takes into account motion of the object on which the receiver/processor is installed. Furthermore, use of optimum methods of signal processing assures the efficiency of such systems when the object is situated in a zone of interference of received radio waves. Figures 3; references 7: 5 Russian, 2 Western.
[15-8617]

8617

CSO: 1860

UDC 621.396.962.8

RADAR STATION WITH ADAPTIVE FREQUENCY TUNING

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian No 8, Aug 79 pp 15-22 manuscript received 14 Apr 78; after revision 26 Sep 78

METTUS, L. S.

[Abstract] The effective scattering area (EPR) of a target as a function of angular coordinates greatly depends on the frequency of irradiation. When both the target and the radar system are in motion, EPR can be at a minimum, leading to attenuation in the reflected signal and possible omission of the target. Radar systems with random pulse-by-pulse frequency retuning were proposed to avoid this problem; their advantages are demonstrated. An increase in the number of subpackets (adaptive spaces) leads to an increase in advantage; when considering the reality of measurements and time constraints of observation, the question arises of finding the optimum relationship between \underline{n} and \underline{m} . When \underline{n} , \underline{m} and \underline{d} approach infinity, the characteristics of detection asymptotically approach the potentially possible. Figures 3; references 5 (Russian).
[15-8617]

8617

CSO: 1860

UDC 621.372.51

OPTIMIZATION OF OUTPUT OSCILLATING SYSTEMS OF WIDE-RANGE TRANSMITTERS

Moscow RADIOTEKHNIKA in Russian No 9, Sep 79 pp 14-18 manuscript received 15 Nov 78

KOZYREV, V. B.

[Abstract] Increasing requirements for reduced emission beyond the band-pass, and expansion of the working range of transmitter frequencies lead to circuit complications and an increase in the dimensions of the output oscillating system. This makes it necessary to optimize the oscillating system and attain minimum weight and size indicators. The number of reactive elements must be minimized and coil inductance and capacitor capacitance must be decreased. For a given K_{fp} there exists an optimum number of filters k_{opt} where the number of their elements, or the total inductance or capacitance are minimum. The quantity k_{opt} is not very critical, and deviations of 1-3 to the greater side and 1 to the lesser are permitted. In filtration of the second harmonic, when k_{opt} , the overlap coefficients range from 1.4 to 1.9, depending on the type of filter. Optimum values of k_{opt} do not depend on desired attenuation. Figures 4; tables 2; references 2 (Russian). [34-8617]

8617

CSO: 1860

UDC 621.396.62:621.391.84

SUPERHETERODYNE RECEIVER WITH WIDE-BAND PRESELECTOR AND VARIABLE INTERMEDIATE FREQUENCY

Moscow RADIOTEKHNIKA in Russian No 9, Sep 79 pp 53-55 manuscript received 4 Jan 79

SARAYEV, S. M.

[Abstract] The basic conditions of attenuation of sensitivity of combined reception channels (KKP) by a preselector are its adequate selectivity, selection of specific IF and limitation of the tuning range. Generalized analysis of the frequency distribution of KKP showed an interrelation between

conditions of attenuation of sensitivity of KKP in analytic form. Receivers can be designed where a change in IF does not occur with noise, but smoothly.

The preselector assures attenuation of sensitivity of all combination channels formed by the first and second signal harmonics, as well as most other KKP, whereas the problem of coupling the tuning of the preselector and the heterodyne vanishes. Figures 2; references 8 (Russian).
[34-8617]

8617

CSO: 1860

ANALYSIS OF CHARGE CAPACITY OF CHARGE-COUPLED DEVICES WITH LATENT CHANNEL

Kiev IZV. VUZ: RADIOELEKTRONIKA in Russian No 8, Aug 79 pp 101-103 manuscript received 11 Jul 78; after revision 13 Nov 78

LAIRIDEV, V. N.

[Abstract] Charge-coupled devices with latent channel (LC CCD) have several advantages over CCDs which operate with a surface channel: increased efficiency of charge transfer, increased speed, reduced noise level. But the LC CCD has a smaller charge capacity than the ordinary CCD. One method to increase information charge density is to decrease the thickness of the surface layer which contains the latent channel to magnitudes under one micron. In order to optimize the structure of LC CCDs, charge capacity and speed are related to surface layer parameters obtained by the method of ion alloying and magnitudes of control voltages. The two-phase structure of LC CCDs has an optimum surface layer thickness where charge capacity is maximum. For a three-phase structure of LC CCDs, the relationship of charge capacity versus surface layer thickness at peak permissible control pulse amplitude is weakly expressed. The maximum value of charge capacity for the above parameters of LC CCDs is $70 \text{ nC } \mu\text{m}^{-1}/\text{cm}^2$. The selection of a value of surface layer thickness must be done on the basis of the desired speed of the LC CCD. Figures 3; references 4: 2 Russian, 2 Western. [15-8617]

8617

CSO: 1860

ENGINEERING METHODS OF APPROXIMATE ANALYSIS OF SYSTEMS

Moscow RADIOTEKHNIKA in Russian No 9, Sep 79 pp 6-13 manuscript received
5 Oct 78

ZAYDEL', S. M.

[Abstract] Operational analysis of systems constitutes a stage in planning radio components and systems and production where decisions are made with little or minimal a priori information. The output function $F(x)$ is a vectorial function of a vectorial variable. In most cases, the analytical relationship $F(x)$ is unknown and depends on numerical operative factors. It is economically unfeasible and sometimes technical impossible to carry out a large number of experiments for precise identification of $F(x)$. The output characteristics of cost, labor intensiveness of a radio component as a function of the primary dependent variable (output, for example) has typical regions: initial region of the characteristic with high relative cost of parametric increase, normal region of characteristics with acceptable economy, origin of constraints and abrupt rise in relative cost. In most cases of planning radiotechnical systems and managing their production, the analytical relationships of technical and economic characteristics are unknown. It then becomes vital to shift to extrapolation methods with incomplete a priori information. Figures 5; tables 2; references 6 (Russian).
[34-8617]

8617

CSO: 1860

USSR

UDC 53:51

ELECTROMAGNETIC FIELDS EXCITED IN THE CAVITY OF A CONDUCTING SHELL BY A FLUX OF PENETRATING RADIATION

Moscow ZHURNAL TEKHNIЧЕСКОY FIZIKI in Russian Vol 49 No 10, 1979 pp 2085-2096 manuscript received 9 Oct 78

BUBER, V. B. and MIKHAYLOV, M. V., All-Union Scientific-Research Institute of Optical and Physical Measurements, Moscow

[Abstract] A method is presented for analysis of nonuniform electromagnetic fields excited in the cavity of a conducting envelope by a variable flux of penetrating radiation. The basic regularities of evolution of these fields are defined and the results of experimental research are presented. Oscillograms illustrate the electron fluxes and electric fields excited. The theory developed is in good agreement with the experimental results. Figures 5; references 5 (Russian).

[64-6508]

6508

CSO: 1860

USSR

UDC 534.16

TRANSVERSE SUPERFICIAL ACOUSTIC WAVES IN SOLIDS PLACED IN A MICROWAVE FIELD

Moscow ZHURNAL TEKHNIЧЕСКОY FIZIKI in Russian Vol 49 No 10, 1979 pp 2240-2242 manuscript received 17 Nov 78

BURLAK, G. N. and KOTSARENKO, N. YA., Kiev State University imeni T. G. Shevchenko

[Abstract] Earlier works have shown the possibility of existence of transverse superficial acoustico-electric waves due to electrostriction in solids when a constant electric field is present. This work shows that similar waves can exist at the boundary between solids when a microwave field is present. This means that coupled electromagnetic and transverse acoustic surface waves can propagate in solids placed a microwave field. The depth of the waves is determined by the amplitude of the microwave pumping field and the ratio of frequencies of the acoustical wave and microwave pumping wave. Figures 1; references 4 (Russian).

[64-6508]

6508

CSO: 1860

USSR

INFLUENCE OF A CORRUGATED MAGNETIC FIELD ON THE DEVELOPMENT OF PARAMETRIC
INSTABILITY IN A SPACE-MODULATED STREAM OF ELECTRONS

Moscow ZHURNAL TEKHNIЧЕСКОY FIZIKI in Russian Vol 49 No 10, 1979 pp 2134-
2140 manuscript received 5 Sep 78

ASEYEV, G. G., KUZNETSOVA, G. G. and REPALOV, N. S., Khar'kov Institute of
Physics and Technology, Ukrainian Academy of Sciences

[Abstract] A study is made of the physical picture of development of instability in a stream of electrons modulated by a spatially periodic electric field and focused by a strong magnetic field which is homogeneous over its length. Amplification of the external 200 MHz signal results from the development of plasma-parametric instability in the modulated electron beam, and significantly exceeds the effects of the use of electric and magnetic fields individually. The amplification is resonant with respect to current and accelerating voltage of the beam and independent of the strength of the magnetic field. Figures 7; references 8: 5 Russian, 3 Western.

[64-6508]

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CSO: 1860

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